ORDA System Control

ORDA Systems Engineering

This paper addresses RDA System Control. A comparison of Legacy Control versus ORDA Control is provided. Changes resulting from security and safety consideration are also highlighted in this report. .

Four (4) basic control states exist in the legacy RDA:

- Remote
- Local
- RMS
- Either

The same four control states exist in ORDA, although two have been renamed to reflect their roles more accurately,. The control states are listed below (with the corresponding Legacy nomenclature in parenthesis where there is a difference):

- RPG (Remote)
- RDA HCI (Local)
- RMS
- Either

Each control state is discussed separately in the following paragraphs. In addition, a discussion of the transfer of control between states is provided later in this report.

1. RPG Control

   This ORDA state is equivalent to the Legacy Remote state. It has been renamed RPG to distinguish it from remote RDA HCI control. The control for this state is defined in the RDA-RPG ICD (2620002). Only transitions to the Either state are allowed from the RPG control state. Furthermore, only the RPG is allowed to request this transition to the Either state. No other control state can force the RPG to relinquish control. However, in the case of wideband failure, the RDA system will relinquish RPG control and will transition to the Either state.

2. RDA HCI Control

   This ORDA state is equivalent to the Legacy Local state. However, there is added complexity due to the fact that several RDA HCIs can be connected to the system concurrently. The RDA HCI may be run on RMS, MSCF equipment, a RDA terminal, or another computer using the diagnostics link. As a result, this state has several new definitions and requirements. It is best to think of RDA HCI as a group of controllers. Because of safety and security considerations, only one (1) RDA HCI can issue commands at any given time. Any RDA HCI can display system state and performance data, but only 1 can change the system state. The ability to change system state will be referred to as "Command Authority". Figure 1 shows an example of four different HCIs connected to the system at the same time. The RDA HCI cannot take control directly from either the RMS or the RPG.

   The RDA HCI running at the RDA inside the shelter will be referred to as the Local Host or "Master HCI". It can take command control from any remote HCI presently commanding the RDA, i.e. the Master HCI has overriding command control capability. All functions are available at the Master HCI. At remote HCIs, the full set of test software is not available. Only those tests that do not require someone to be physically at the site are available on the remote HCIs.

3. RMS Control

This control state is the same between ORDA and Legacy. The control for this state is defined in RDA-RMS ICD (2620004). Similar to the RPG state, only transitions to the Either state are allowed from the RMS control state. Furthermore, only the RMS is allowed to request this transition to the Either state. No other control state can force the RMS to relinquish control. However, in the case of connection failure, the RDA system will relinquish RMS control and will transition to the Either state. This RMS state is not the same as that of an RDA HCI running on RMS equipment. The RMS control state can only issue the commands explicitly identified in the RDA-RMS ICD, whereas an RDA HCI running on the RMS can issue all commands accessible through the remote HCI.

4. Either Control

   This state is identical to the Legacy Either state. No specific entity is in actual control of the system. The first controller to issue a command will assume control. If any RDA HCI, local or remote, issues a command, the system will fall into RDA HCI control. The RDA HCI that issued the command will have immediate control and will be designated the Command Authority. Command Authority and the concept of a group of RDA HCIs are discussed further in the next few paragraphs.

Since the RDA HCI control state can be defined as a group of HCIs, one local and the rest remote, sharing control, the system must provide a way to insure that no one HCI can lock command from all other HCIs. This functionality is accomplished through the use of Command Authority timeouts. The Local Host HCI, also referred to as the Master HCI, will have a different timeout from the remote HCIs. If an HCI with Command Authority fails to issue a command for 10 minutes (this timeout period is configurable) or if the link failure is detected, command authority will revert to the entire RDA HCI group. The next member of this group, which includes the same HCI that just lost Command Authority, to issue a command will now have Command Authority. Note that system control has been in RDA HCI during this entire time.

Command Authority must be relinquished by the remote HCI user or relinquished through the timeout. No remote HCI can usurp Command Authority from any other member of the RDA HCI group. However, this is not the case for the Local Host HCI, i.e. Master HCI. The Master HCI can take Command Authority from any remote RDA HCI. An appropriate message will be displayed on the remote HCI screen when the Master HCI has taken Command Authority. Further, the Master HCI has a much longer timeout (also configurable) than remote HCIs. The longer timeout is for technician safety during maintenance work. Since no remote HCI can usurp Command Authority, the technician need not fear that command control will be lost during the maintenance work. This structure also allows enough flexibility for cases when the technician forgets to relinquish Command Authority to the RDA HCI group. In this case, the Master HCI will lose Command Authority after the system times out. When the Master HCI timeout occurs, the system Command Authority will be available to all members of the RDA HCI group. As a result, a remote HCI, for example running on the RMS or MSCF equipment, can take Command Control. Once this HCI has control, it can relinquish control and put the system into the Either control state so that RPG or RMS can obtain control.

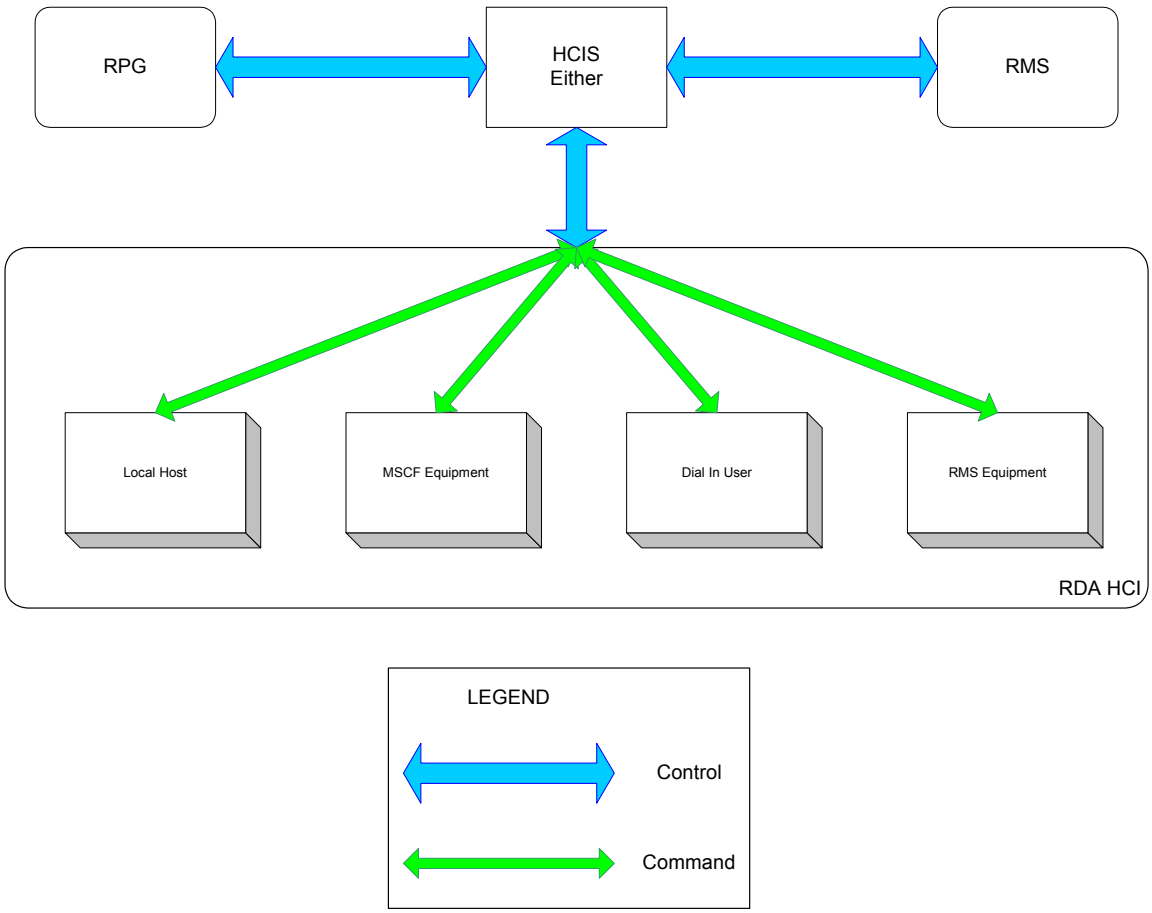

Figure 1: Control & Command Links

Desired / Current	RPG	Local Host	RDA HCI	RMS	Either
RPG	X	X	X	X	**Select**
Local Host	X	X	X	X	**Select**
RDA HCI	X	**Take**	X	X	**Select**
RMS	X	X	X	X	**Select**
Either	**Take**	**Take**	**Take**	**Take**	X

Figure 2: Control State Transition Matrix

The remainder of the paper will present example scenarios using different system control states. Figure 1 and figure 2 should be used throughout as reference aids for understanding the control state logic.

1. Example: RPG in Control, Local Host desires control.

   Local Host cannot take control directly from the RPG, see figure 2. First, the RPG must relinquish control to put the system in the Either state. From the Either state, the Master HCI (i.e. Local Host) can issue a command and as a result, it will have Command Authority control. This will put the system into the RDA HCI control state.

2. Example: RMS in Control, Local Host desires control.

Local Host cannot take control directly from the RMS, see figure 2. First, the RMS must relinquish control to put the system in the Either state. From the Either state, the Master HCI (i.e. Local Host) can issue a command and as a result, it will have Command Authority control. This will put the system into the RDA HCI control state.

3. Example: remote RDA HCI has Command Authority, RPG desires control

   Since a remote RDA HCI has Command Authority, this means that the system in is the RDA HCI control state. The RPG cannot take control from the RDA HCI. Typically during normal system operation, the RPG requests control almost immediately after it relinquishes control. As a result, the system has a pending RPG control request. As soon as the RDA HCI relinquishes control to go to the Either state, the pending RPG control request is executed; thereby transitioning the system quickly through the Either state to the RPG control state.

4. Example: remote RDA HCI has Command Authority, but loses connection and RPG desires control

   Consider what happens when a remote RDA HCI loses connection to the system. In this case, the remote RDA HCI would not be able to relinquish control allowing the system to go to the Either state. In this case, the system will wait for the remote RDA HCI Command Authority to timeout. However, even after the timeout, the system is still in the RDA HCI group control state. But other members of the RDA HCI group can now issue commands and obtain Command Authority. A technician at the MSCF or RMS equipment can obtain Command Authority or another remote RDA HCI user can obtain Command Authority (on a first come first serve basis). Once the technician has Command Authority at his/her HCI, the remote RDA HCI can follow the same sequence provided in example 2 to relinquish control. This will put the system into the Either state and will allow the pending RPG control request to be executed transitioning the system to the RPG control state.

5. Example: Master HCI has Command Authority, the RPG desires control

   This simple example is the same as example 2 in the sense that there is no operational difference between Master HCI and remote HCI in regards to command control. However, consider the case when the technician leaves the site with the system in the RDA HCI control state and with the Master HCI having Command Authority. In the Legacy system, if the technician left the system in the Local state, the user was required to return to the shelter to relinquish control. In the ORDA design, the user need not return to the shelter. The user can wait for the Master HCI Command Authority to timeout. Once the Master HCI timeout relinquishes Command Authority, any other HCI in the group can obtain Command Authority. The technician at the MSCF can now use the remote HCI to relinquish system control transitioning to the Either state. Since the RPG has a control request pending, the system would then immediately transition to the RPG control state.

These examples illustrate the difference between the system control and Command Authority. Command Authority is given to a specific HCI under the RDA HCI group. Relinquishing Command Authority is not the same as relinquishing Control because the system will still be in the RDA HCI control state (equivalent to the Legacy Local control state). The distinctions between control state and Command Authority are made with safety as the first criteria and then for security. During normal operation, the system will remain primarily in RPG control for the majority of the time. The RDA HCI control state will be used primarily when a technician needs to perform maintenance on the system. Also note that a remote HCI does not require Command Authority or that the system be in the RDA HCI control state to view status or performance/maintenance information.